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# Influence of hand rub volume on hand coverage, spillage and user preference

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## Introduction

Hand hygiene is the most important measure for the prevention of healthcare-associated infections. However, there is a gap between how it is performed vs. how it should be performed. Current standards for testing the efficacy of an alcohol-based hand rub (ABHR), such as EN 1500 for hygienic hand disinfection, are performed mostly with a volume of 3 mL [1]. Nevertheless, the volume used in daily practice is often below the recommendations and some ABHRs require larger volumes (> 3 mL) to pass the required standards [2,3].

**An initial study evaluated factors such as coverage, spillage, drying times, and satisfaction with the handling of ABHRs in different formats – liquid, gel and foam – when rubbing according to manufacturers' instructions. In a next step, the influence of volume on hand coverage was investigated.**

## Method

Evaluation of the different ABHR formats was performed with 3 different ABHRs containing 85% (w/w) ethanol. Participants were asked to rub their hands on 3 different days using the respective ABHR formats and the volume specified by the manufacturer. Rubbing was performed above an A3 sheet of paper to detect spillage and the time was measured until the volunteers felt their hands were dry.

To investigate the influence of ABHR volume on hand coverage, volunteers were asked to rub their hands for 30 sec. with a propanol-based hand rub (75% (w/w)), using a specified volume ranging from 0.5 to 3 mL on 6 days (e.g. 3 mL day 1, 1.5 mL day 2, 0.5 mL day 3).

In both studies, the responsible rub-in technique* was applied. Volunteers' experience of hand rubbing ranged from novice to experienced. Hand coverage was measured using a Semmelweis Scanner and volunteers were asked to rate their satisfaction with the product (scale of 1-5, 5=very satisfying). For all analyses, ABHRs mixed with a fluorescent dye (Visirub®) were used.

## Results

### ABHR formats

Regardless of the format, good coverage was achieved with all three formats. The liquid hand rub dried significantly faster than the foam or gel. Volunteers rated the foam and liquid as easier to use than the gel. The foam rub spilled significantly less than the others (fig. 1)

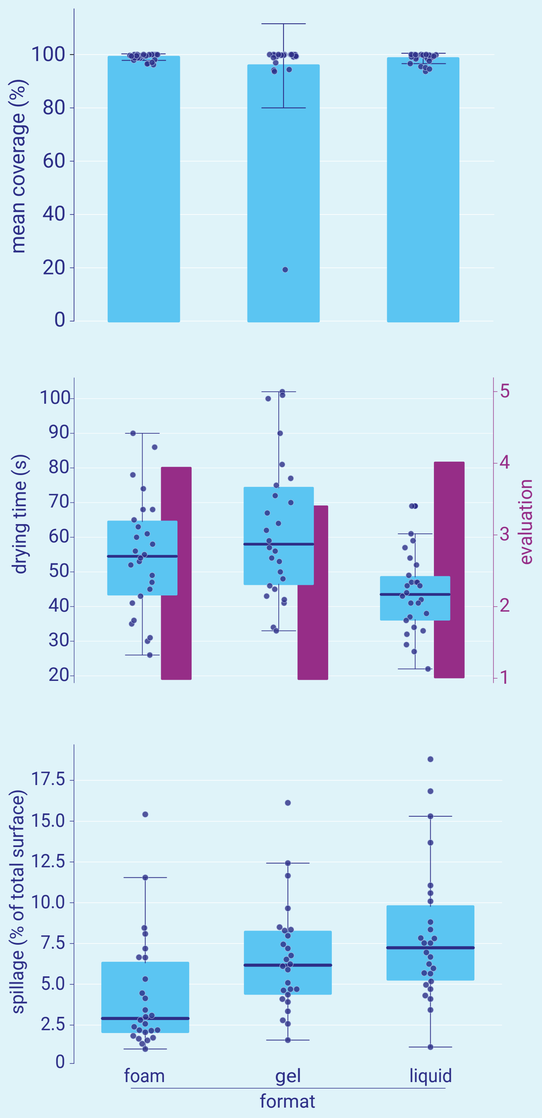


**Fig. 1: Mean hand coverage, drying time or spillage per hand rub format.** Boxplots with whiskers to represent minima and maxima (1.5 x IQR), boxes to represent first and third quartiles and lines in boxes to represent the median. Evaluation of hand rub format: purple bars. n=26.

### ABHR volumes

Volumes of 1 mL were sufficient to cover 95% of the hands within approximately 20 seconds. However, volumes below 2 mL were rated worse than higher volumes with 2 mL resulting in the best evaluations (fig. 2, A-C). There was a moderately strong but significant correlation between hand coverage and hand rub volume or rub-in time, respectively (fig. 2, B & D).

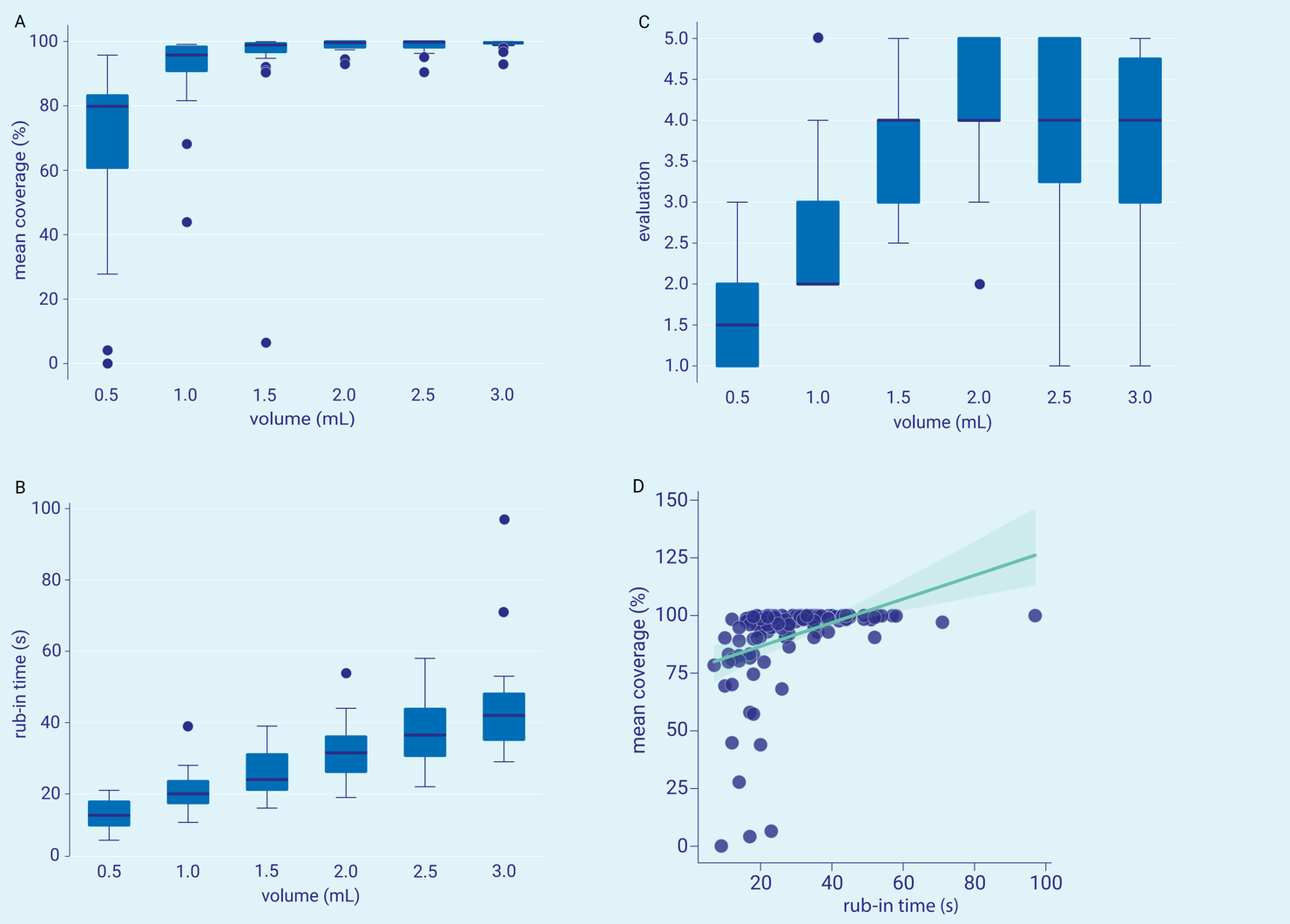


**Fig. 2: Mean hand coverage, rub-in time or evaluation per hand rub volume.**
A-C: Boxplots with whiskers to represent minima and maxima (1.5 x IQR), boxes to represent first and third quartiles and lines in boxes to represent the median. D: Scatterplot with regression line to represent correlation of data and dots representing each measurement. p: < 0.005. n=22.

* rub-in technique without specific order or steps with focus on complete coverage of hands as well as fingertips and thumbs.

## Conclusion

The results of the study provide insight into the requirements for effective hand disinfection, helping to bridge the gap between theory and daily practice. Here, we demonstrate that sufficient hand coverage can be achieved with low volumes (> 1 mL), and that user preference is directly linked to the volume used and the format's ease of use. The volumes that yielded in sufficient hand coverage are to be further analysed regarding their antimicrobial efficacy by additionally probing the hands before and after disinfection.

### Conflict of Interest

The authors are employees of BODE Chemie GmbH, a company of the HARTMANN Group, which is a manufacturer and vendor of disinfectants.

### References

[1] DIN EN 1500:2013: Chemical disinfectants and antiseptics - Hygienic handrub - Test method and requirements (phase 2/step 2). 2013.
[2] Martinello *et al.* (2019) ICHE 40(11):1248-1252
[3] Desinfektionsmittel-Kommission im VAH (Hrsg.). Volumenangabe bei der Listung von hygienischen Händedesinfektionsmitteln. 11/2021.

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